

- Page 79 The resistance is directly proportional to the length and inversely proportional to the cross-sectional area.
- Page 81 In a series circuit, the equivalent resistance is the sum of the resistances: $R_{eq} = R_A + R_B + R_C$
- Page 86 The original locations of the poles stay the same; however, new poles are formed at each end of the breaking point.
- Page 87 The north pole is where the magnetic field lines leave the magnet.
- Page 88 a circular field in a counterclockwise direction; a right-hand rule
- Page 89 An EMF is induced in the wire.

Caption Questions

- Page 71 Figure 4.4 If there is a charge on the knob, the leaves repel.
- Page 71 Figure 4.5 The leaves acquire similar charges and therefore repel each other.

Quick Review

Pages 72–73

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|-------|-------|-------|--------|
| (1) 1 | (4) 2 | (7) 1 | (10) 1 |
| (2) 3 | (5) 2 | (8) 3 | (11) 4 |
| (3) 4 | (6) 4 | (9) 4 | |

Pages 76–78

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|--------|--------|--------|--------|
| (12) 4 | (15) 4 | (18) 4 | (21) 4 |
| (13) 2 | (16) 2 | (19) 4 | (22) 1 |
| (14) 1 | (17) 2 | (20) 3 | |

(23) $\Delta V = \frac{W}{q} = \frac{Fd}{q}$

Substituting in $E = \frac{F}{q}$ gives

$\Delta V = Ed$

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|--------|--------|--------|
| (24) 4 | (25) 3 | (26) 1 |
|--------|--------|--------|

Pages 84–85

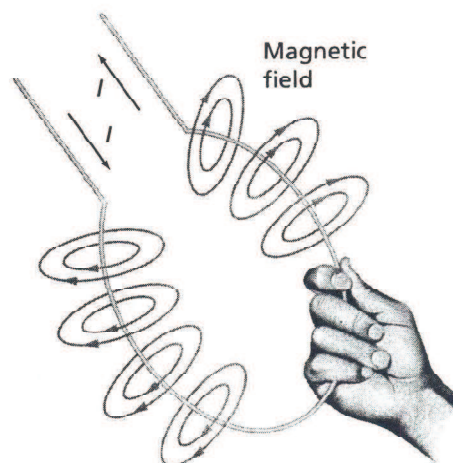
- | | | | |
|--------|--------|--------|--------|
| (27) 2 | (30) 3 | (33) 4 | (36) 1 |
| (28) 1 | (31) 2 | (34) 3 | |
| (29) 3 | (32) 2 | (35) 3 | |
- (37) As voltage is increased, the temperature of the wire increases. This affects the resistance, but has nothing to do with the validity of Ohm's law, which applies to the resistance of a given wire at a certain temperature.
- (38) Wires heat up because current creates electric energy in the circuit, which is converted to thermal energy.
- | | | | |
|--------|--------|--------|--------|
| (39) 2 | (40) 3 | (41) 4 | (42) 1 |
|--------|--------|--------|--------|
- (43) Thicker wires will increase current while longer wires will decrease current.

- (44)a 12.0 Ω
 b 1.0 A
 c $V_1 = 3.0 \text{ V}$; $V_2 = 5.0 \text{ V}$; $V_3 = 4.0 \text{ V}$

- (45) 3 (46) 3

Page 90–92

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|--------|--------|--------|--------|
| (47) 1 | (48) 2 | (49) 1 | (50) 3 |
|--------|--------|--------|--------|
- (51) The field of the compass needle aligns with Earth's magnetic field. The north end of a magnet is a south-seeking pole. Earth's magnetic south pole is near its geographic north pole and therefore the magnet in the compass points toward the north pole.
- (52) 4
- (53)



- (54) **Same:** opposite charges and opposite poles attract, and like charges and like poles repel.

Different: a particle cannot be just a north or a south pole. It has to have both poles. A charge can be just + or -.

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|--------|--------|--------|
| (55) 1 | (57) 1 | (59) 1 |
| (56) 1 | (58) 4 | |

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Part A

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|-------|--------|--------|--------|
| (1) 1 | (7) 1 | (13) 3 | (19) 2 |
| (2) 4 | (8) 1 | (14) 3 | (20) 1 |
| (3) 1 | (9) 4 | (15) 4 | (21) 2 |
| (4) 1 | (10) 4 | (16) 4 | |
| (5) 2 | (11) 1 | (17) 4 | |
| (6) 2 | (12) 1 | (18) 1 | |

Part B–1

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|--------|--------|
| (22) 3 | (25) 1 |
| (23) 2 | (26) 1 |
| (24) 1 | (27) 3 |